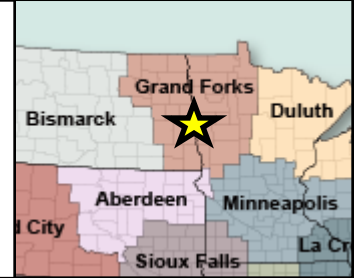


# National Weather Service Grand Forks



## Weather & Climate Review

February-March 2023



### February

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	AveW	WDept	Av>15	Av>20	PWnd	HDD	CDD	Tstms	DFog	Clear	PCldy	MCldy
DVL	9.8	-0.8	38	-27	M	M	M	11.9	M	7	1	50	1539	0	0	4	14	7	7
NWS GF	10.8	-1.4	39	-22	0.19	-0.37	5.0	M	M	M	M	M	1508	0	M	M	M	M	M
GFK	9.5	-1.1	39	-26	0.28	-0.23	5.9	12.2	1.1	7	1	65	1549	0	0	3	8	17	3
RDR	10.4	-0.2	39	-27	M	M	M	10.9	M	7	0	55	1523	0	0	0	9	14	5
FAR	10.6	-2.8	36	-21	0.36	-0.33	4.8	11.9	0.6	8	0	65	1516	0	0	7	14	11	3
BDE	14.0	4.3	47	-28	M	M	M	8.5	1.0	2	0	42	1423	0	0	0	11	13	4
PKD	12.8	0.5	44	-30	M	M	M	8.6	-0.1	1	0	45	1453	0	0	4	11	13	4
BJI	12.6	2.0	47	-29	M	M	M	8.0	M	1	0	33	1460	0	0	2	11	12	5
TVF	10.5	0.5	39	-25	M	M	M	11.0	M	5	0	41	1519	0	0	4	15	9	4
Y63	12.0	-0.7	38	-25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
AGA	8.6	-2.7	40	-33	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Table 1 February 2023 Temperature and Precipitation Statistics

In Table 1, **DVL** = Devils Lake, **NWS GF** = NWS Grand Forks, **GFK** = GF Airport, **RDR** = GF Air Force Base, **FAR** = Fargo, **BDE** = Baudette, **PKD** = Park Rapids, **BJI** = Bemidji, **TVF** = Thief River Falls, **Y63** = Elbow Lake, **AGA** = Agassiz MN NWR. **AveT** = monthly average temperature, **TDept** = monthly departure from normal, **THigh** = highest temperature of the month, **TLow** = lowest temperature of the month, **Pcpn** = monthly precipitation, **PDept** = departure from normal precipitation, **Snow** = monthly snowfall, **AveW** = average monthly wind speed (mph), **WDept** = departure from average wind (1998-2022), **Av>15** = number of days with an average wind speed greater than 15 mph, **Av>20** = number of days with an average wind speeds greater than 20 mph, **PWnd** = peak wind speed in mph, **HDD** = monthly total Heating Degree Days, **CDD** = monthly total Cooling Degree Days, **Tstms** = number of days with thunder, **DFog** = number of days with visibility <=1/4 mile in fog, **Clear** = number of days with sky cover 0-3 tenths, **PCldy** = number of days with sky cover 4-7 tenths, **MCldy** = number of days with sky cover 8-10 tenths.

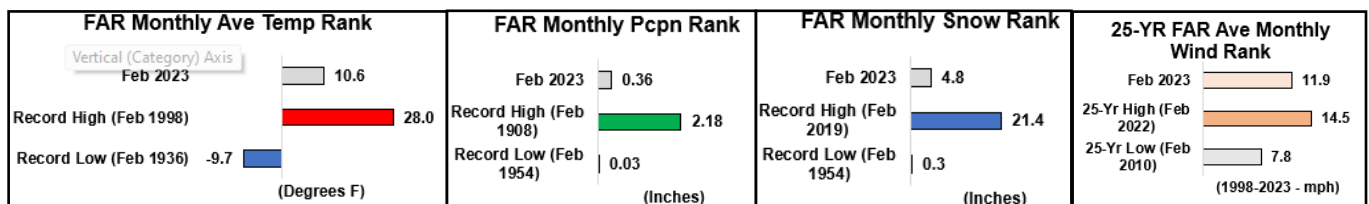


Figure 1 February 2023 Fargo Temperature, Precipitation, & Wind Statistics Compared to Records

Per Table 1, the February average temperature was a little above or a little below normal at all sites. Baudette ended up 4.3 degrees above normal. Precipitation amounts were below normal at the three winter sites. The monthly average wind speed was near or slightly above normal at the four ASOS sites with available 25-year averages (most ASOS's were commissioned around 1998, so this data is a consistent computerized-era set, that followed manual human observations).

Figure 1 compares the February 2023 average temperature (AveT), precipitation (Pcpn), snowfall (Snow), and monthly average wind speed (AveW) at Fargo to the established records (AveW only goes back to 1998). Last February was quite windy at Fargo (average 14.5 mph), while the average wind this February was lower, at 11.9 mph.

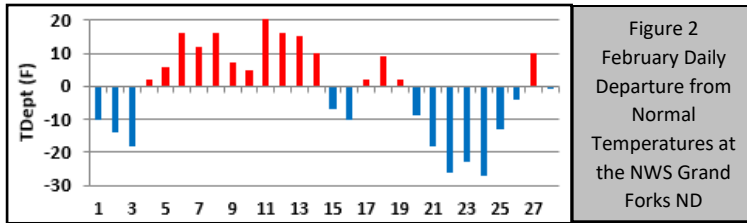


Figure 2  
February Daily  
Departure from  
Normal  
Temperatures at  
the NWS Grand  
Forks ND

Blue Bars = Colder than Normal Days & Red Bars = Warmer than Normal Days

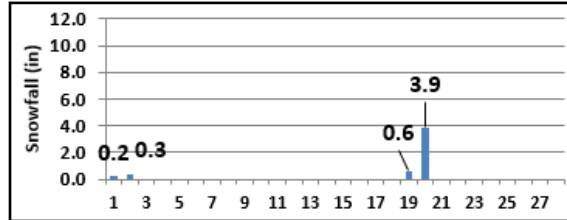


Figure 3  
February Daily  
Snowfall Totals  
NWS Grand Forks  
ND

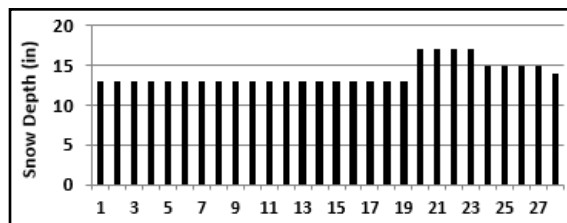


Figure 4  
February Daily  
Snow Depth  
NWS Grand Forks  
ND

Figure 2 plots the daily departure from normal temperatures in February 2023 at the NWS Grand Forks. A warm stretch from February 4th to 14th was bounded by colder stretches. Figure 3 shows the February daily snowfall totals at NWS Grand Forks. The highest total occurred on the 20th, with 3.9 inches of snow. Figure 4 shows the February daily snow depth at the NWS Grand Forks (which is measured at 6 am). There was not much change in the snow depth over the month.

Figures 5 and 6 below are new graphs. Figure 5 plots the daily cloud cover at the Grand Forks Airport along with the daily solar radiation at the Agassiz NWR (only January & February are shown so far). With the days getting longer, the amount of solar radiation is slowly increasing. Figure 6 plots the Fargo highs and lows against the normals and records. This is a different way to look the monthly temperature trends.

## Records

At Fargo-Moorhead, no records were set.

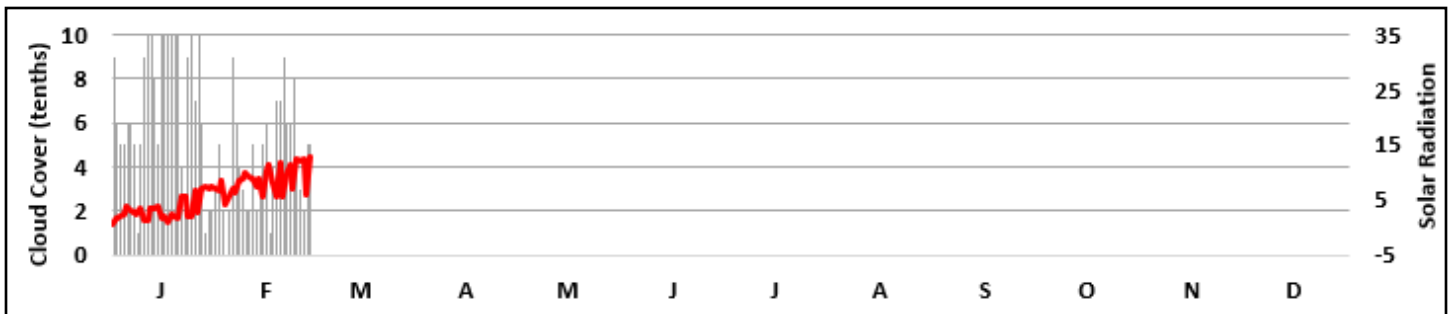


Figure 5 February 2023 - Grand Forks Airport cloud cover (tenths, in black) and Agassiz NWR solar radiation ( $\text{MJ/M}^2$ , in red)

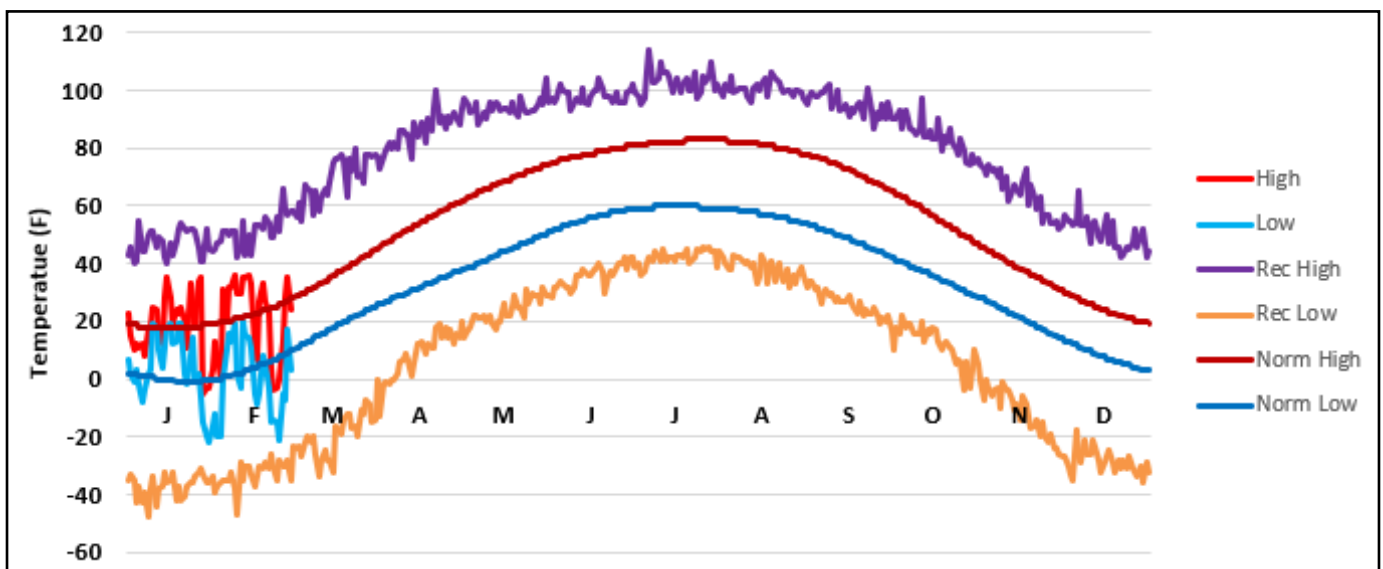


Figure 6 Fargo Airport February 2023 highs and lows compared to normal and records

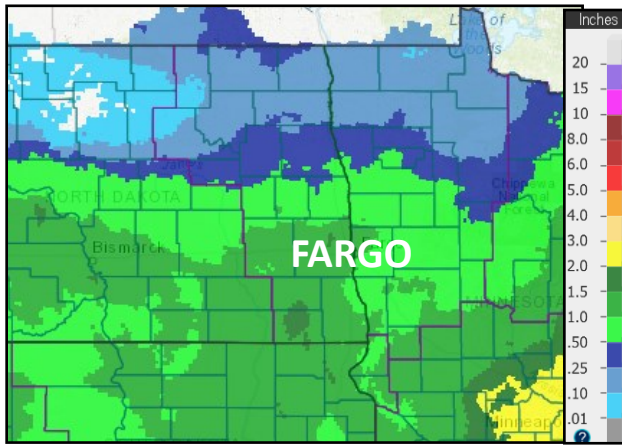


Figure 7 February Observed Precipitation

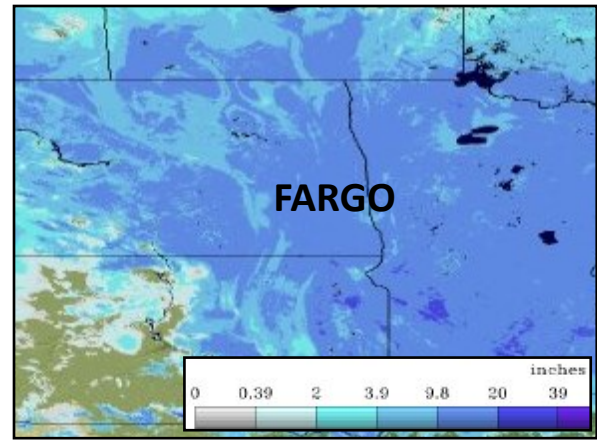
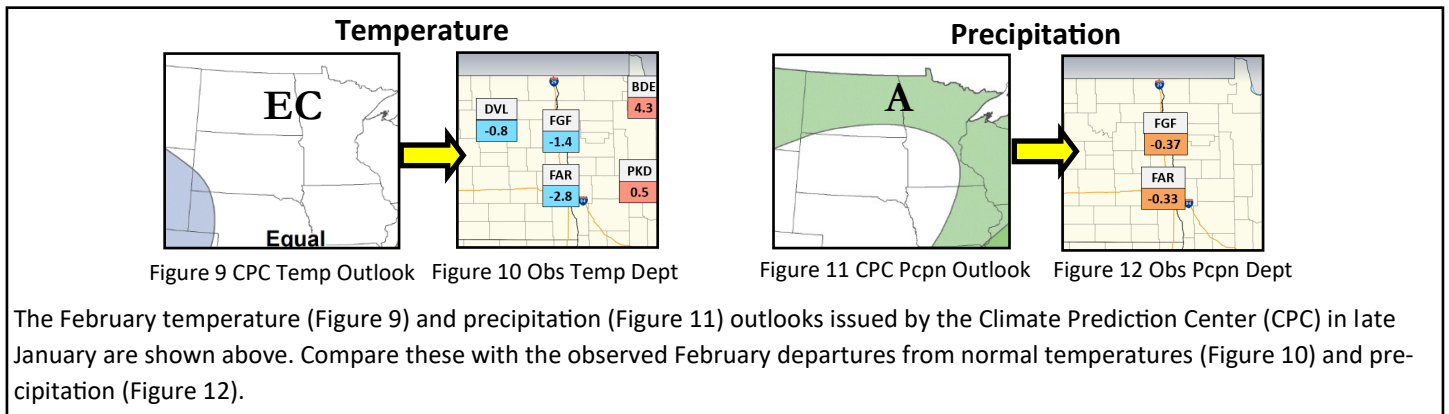
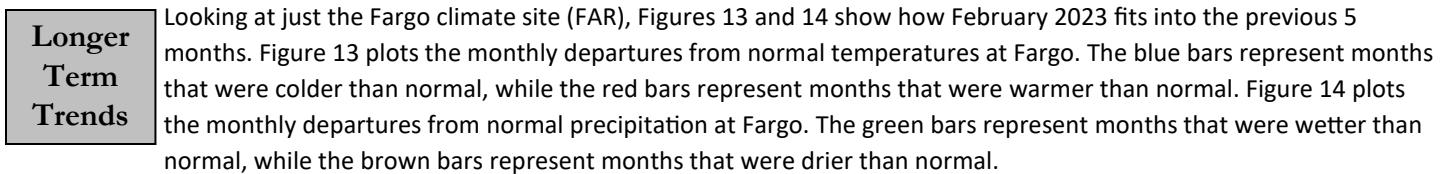


Figure 8 February 28th Snow Depth

Figure 7 gives a February precipitation estimate for all of eastern North Dakota and the northwest quarter of Minnesota. The heaviest amounts fell south of the highway 2 corridor, about 0.50 to 1.50 inches (the light green colors). Figure 8 shows the snow depth across the region on February 28th. Most of the area had 10 to 20 inches of depth.



The February temperature (Figure 9) and precipitation (Figure 11) outlooks issued by the Climate Prediction Center (CPC) in late January are shown above. Compare these with the observed February departures from normal temperatures (Figure 10) and precipitation (Figure 12).



After a slightly warmer than normal January, February turned colder again (Figure 13). December 2022 was the only month with an above normal monthly precipitation total (Figure 14).

Figure 15 tracks how much precipitation has fallen since January 1, 2023, and how it compares to normal and last year. Snowfall is also tracked for the snow season, which began on July 1, 2022.

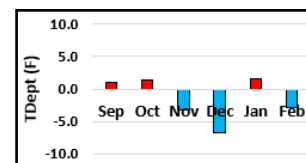


Figure 13 Monthly Departures from Normal Temps at Fargo, ND

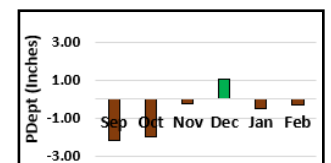


Figure 14 Monthly Departures from Normal Pcpn at Fargo, ND

	Observed Value	Normal	Departure from Normal	Last Year
Pcpn Since Jan 1	0.59	1.40	-0.81	1.15
Snow Since Jul 1	35.6	38.1	-2.5	46.2

Figure 15 Yearly Precipitation & Seasonal Snowfall Trends at Fargo

## U. S. Drought Monitor

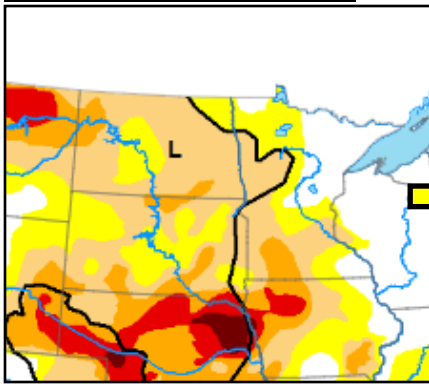


Figure 16 U. S. Drought Monitor, January 26

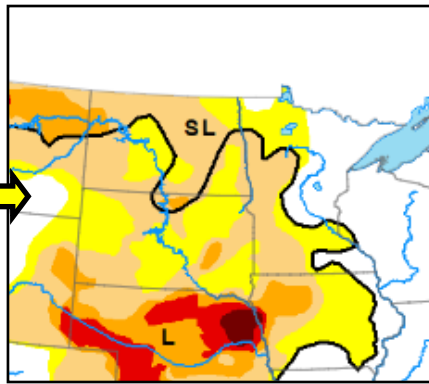


Figure 17 U. S. Drought Monitor, February 28

Not much changed over eastern ND and the northwest quarter of MN from January into February (Figures 16 & 17). The key for both figures is shown below.

### Intensity and Impacts

None	D3 (Extreme Drought)
D0 (Abnormally Dry)	D4 (Exceptional Drought)
D1 (Moderate Drought)	No Data
D2 (Severe Drought)	

## Soil Moisture

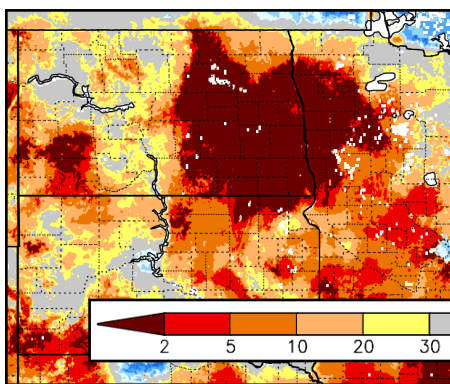


Figure 18 NASA 0-100cm Soil Moisture January 31

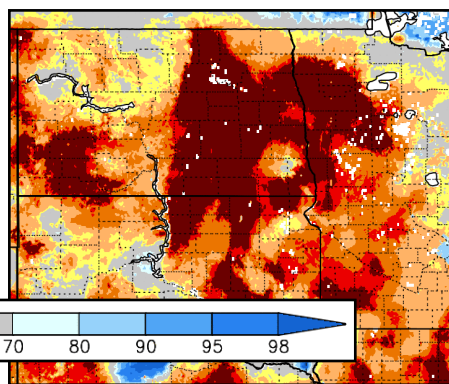


Figure 19 NASA 0-100cm Soil Moisture February 28

NASA SPORT: 0-100 cm soil moisture percentile data has been shown to be useful for drought monitoring. The 0-10cm layer responds quickly to heavy precipitation and rapid drying events. The 0-100cm layer evolves much slower and shows a greater utility for drought monitoring.

Figures 18 and 19 are new graphics as well. These will hopefully show more utility during the warmer months. There will not be much change over the winter.

## Rivers

Gage heights on the Red River at Fargo and Grand Forks are shown (below) for the past 6 months. Both rivers are frozen during the winter months, and are only included for reference.

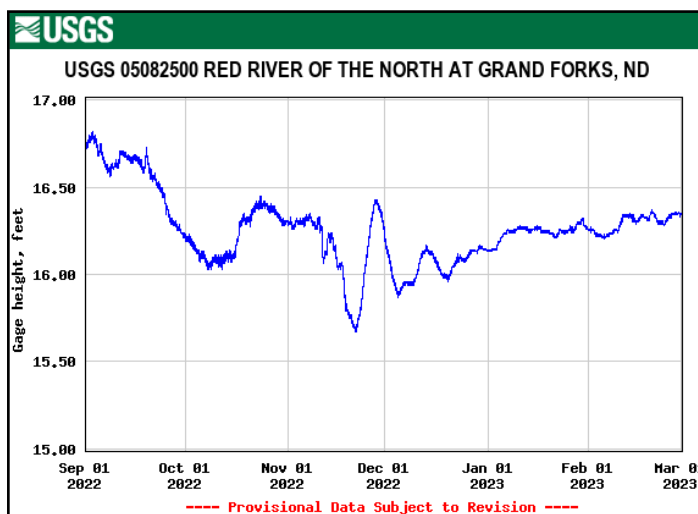


Figure 20 Red River Level at Grand Forks ND

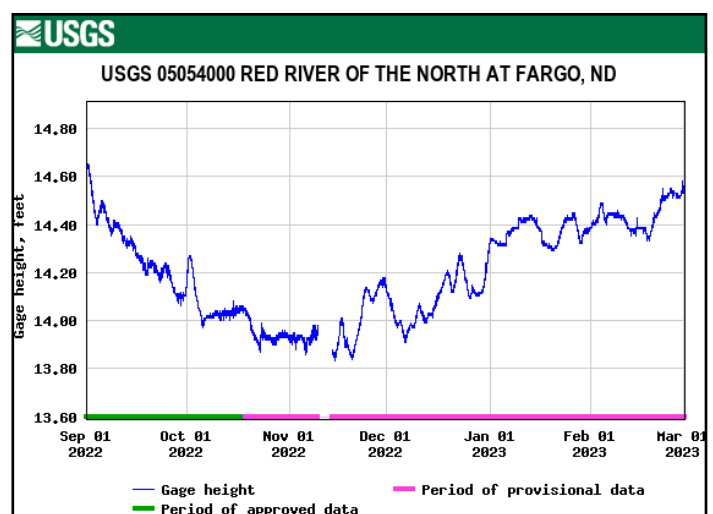


Figure 21 Red River Level at Fargo ND

## Winter Warnings

The first half of February 2023 was relatively quiet, but the second half turned more active. Two Blizzard Warnings, 2 Winter Storm Warnings, and 1 Wind Chill Warning were issued. The two snowfall maps (Figures 26 and 28) showed most of the snow fell across the southern half of the area.

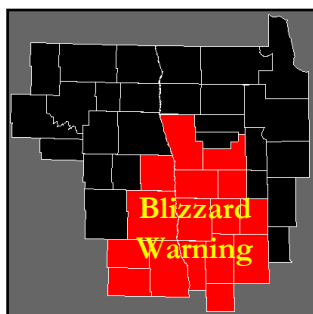


Figure 22 February 14-15  
Blizard area



### Peak Winds

Fargo Airport 66 mph  
Halstad 64 mph  
Herman 63 mph  
East Grand Forks 59 mph  
Wahpeton 58 mph

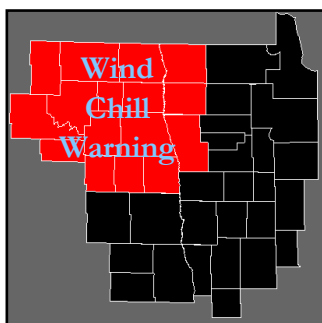


Figure 23  
February 22-23  
Wind Chill Warning area  
(-40F to -50F wind chills)

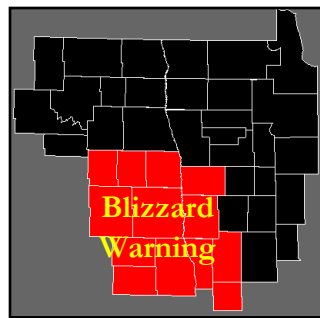


Figure 24 February 22-23  
Blizzard area



Peak Winds  
 Fargo Airport 46 mph  
 Kent 45 mph  
 Gwinner 43 mph  
 Moorhead 43 mph  
 Dilworth 42 mph

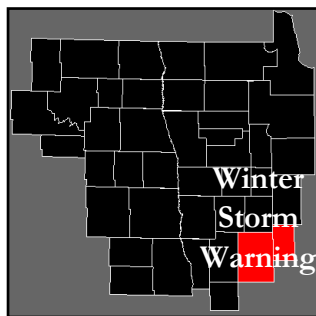


Figure 25 February 22-23  
Winter Storm area

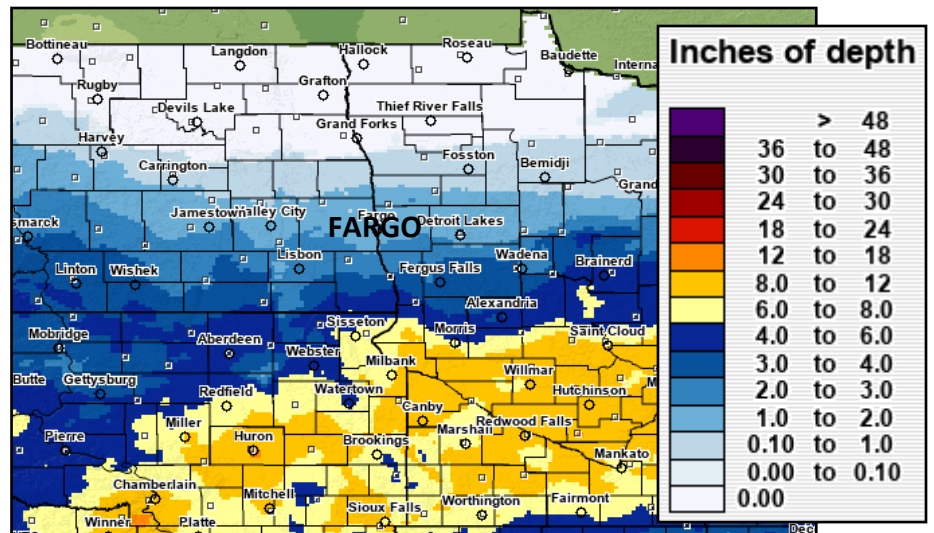


Figure 26 February 22-23 Snow Totals

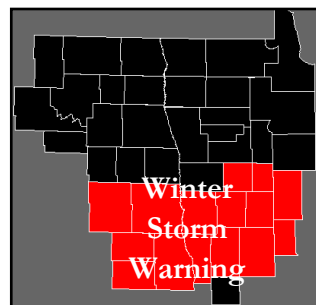


Figure 27 February 28-March 1  
Winter Storm area

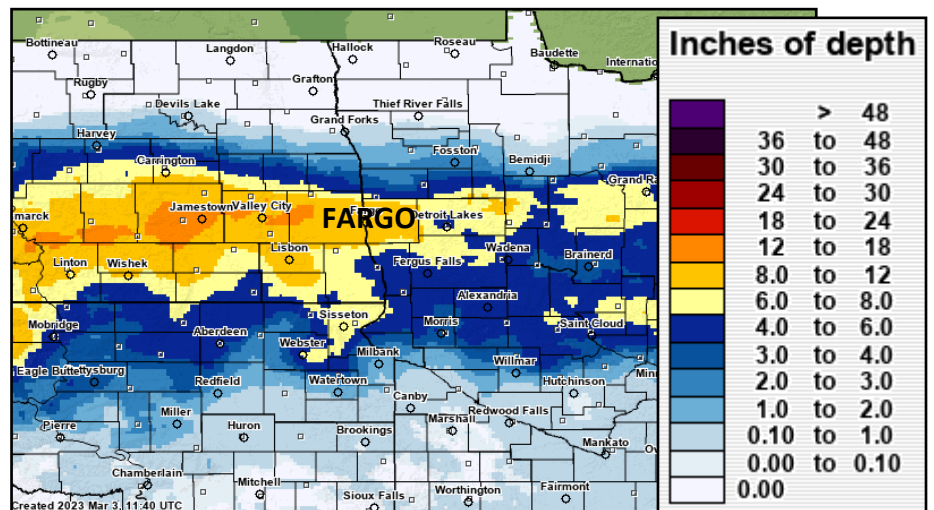
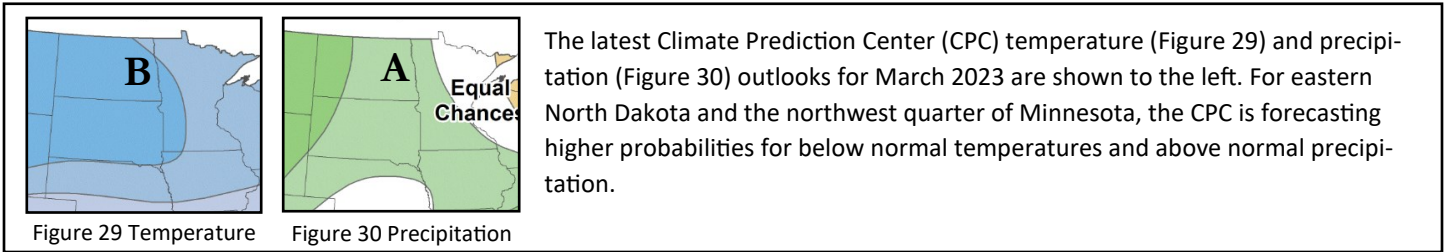


Figure 28 February 28-March 1 Snow Totals

## March



### Sunrise/Sunset

Fargo, ND

Mar 1 Sunrise: 7:08 am

Sunset: 6:11 pm

Mar 31 Sunrise: 7:10 am

Sunset: 7:54 pm



Daylight Saving Time begins Sunday, March 12, at 2:00 a.m.

### Last Year & Normals

Per Table 2, in March 2022, the monthly average temperature was below normal at all sites. Precipitation amounts were also below normal at the NWS Grand Forks and Fargo (the 2 primary winter measuring sites).

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	PWnd
DVL	23.1	-0.2	48	-10	M	M	M	M
NWS GF	24.0	-1.4	54	-9	0.25	-0.66	1.7	M
GFK	22.0	-2.4	52	-14	0.30	-0.61	1.0	46
RDR	24.1	-0.3	55	-10	M	M	M	45
FAR	25.3	-1.9	56	-9	0.51	-0.74	5.5	49
BDE	22.0	-1.7	54	-18	M	M	M	53
PKD	23.0	-3.3	52	-21	M	M	M	54
BJI	22.4	-1.6	53	-18	M	M	M	41
TVF	22.6	-1.8	54	-16	M	M	M	52
Y63	24.7	-2.2	52	-15	M	M	M	M
AGA	19.8	-5.9	52	-27	M	M	M	M

Table 2 March 2022 Temperature and Precipitation Statistics

Figure 31 shows normal highs and lows on March 1st for selected cities across eastern North Dakota and northwest Minnesota. Figure 32 shows how normal highs and lows change by March 31st. As an example, at NWS Grand Forks on March 1st, the normal high is 26 and the normal low is 9. By March 31st, the normal high rises to 43 and the normal low rises to 24. Figure 33 shows the normal precipitation and snowfall amounts for a few selected sites. As an example, the normal precipitation at NWS Grand Forks in March is 0.91 inches and the normal snowfall is 7.8 inches.

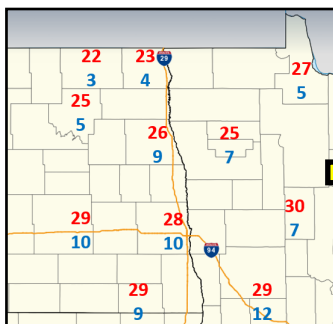


Figure 31 Normal Temps Mar 1

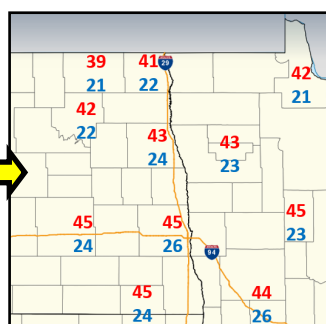


Figure 32 Normal Temps Mar 31

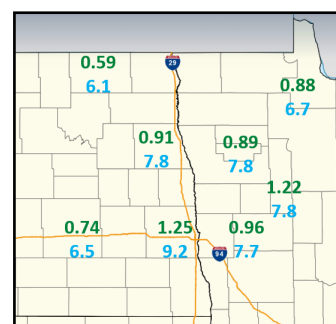


Figure 33 Normal Mar Pcpn/Snow

## Winter Warnings

After a very active December 2021, January 2022, and February 2022, only one Winter Storm Warning was issued in March 2022 (on the 30th, Figure 34 below). The corresponding snow totals are shown in Figure 35. In addition, on March 10th, three Snow Squall Warnings were issued (see Figures 36-38). Snow Squall Warnings are a relatively new product, and are issued much like summertime convective warnings (except they are for certain winter thresholds).

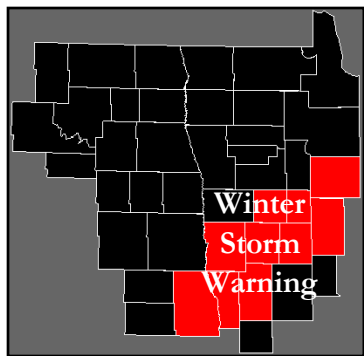


Figure 34 March 30 Warning Area

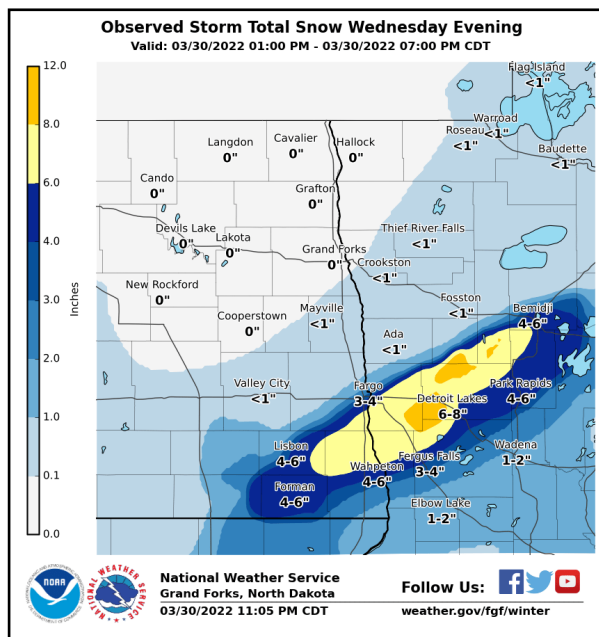


Figure 35 March 30 Snow Totals

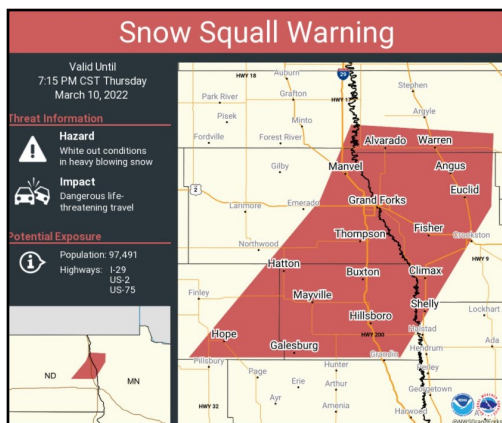


Figure 36 March 10 Warning 1

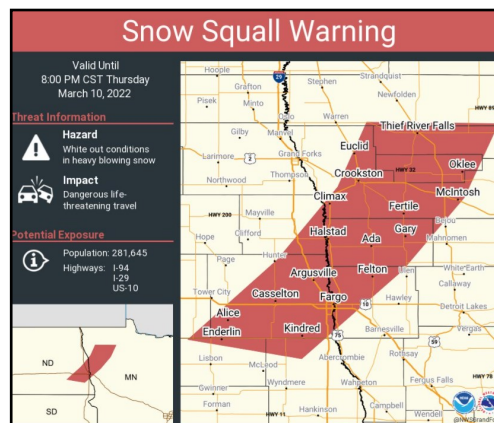


Figure 37 March 10 Warning 2

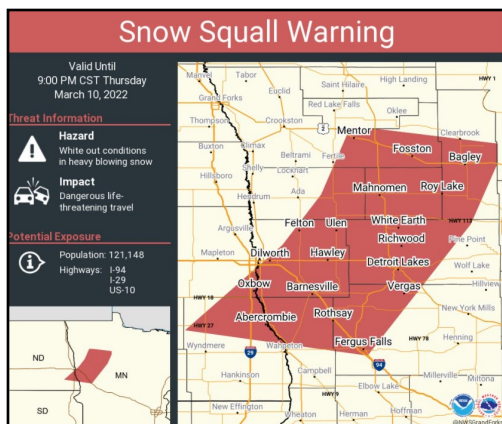


Figure 38 March 10 Warning 3

